

“BREAST CUP CONSTRUCTION”

FIELD OF INVENTION

The present invention relates to a method of producing a breast cup for a brassiere or other garment of clothing and in particular although not solely to a method of producing a breast cup which incorporates a panel of a contrasting appearance.

The present invention also relates to a breast cup for incorporation with other components to define a brassiere or other garment of clothing which may be defined by the methods of the present invention.

BACKGROUND

Brassieres which incorporate a breast cup construction of a moulded or mouldable material are becoming more prevalent. One of the advantages that is brought about by a moulded breast cup construction is a more simplified method of manufacture. Normally a moulded breast cup construction will reduce the number of panels required to define the breast cup since the three dimensional cup form can be formed by a moulding step. Traditionally cups have been formed by the stitching of a plurality of panels together to define the three dimensional cup form.

However, the provision of a breast cup construction of a basic moulded form has a reasonably plain appearance. Unlike the traditionally multi panel sewn form of cup constructions, the moulded cup form generally consists of a single panel of material and in general does not incorporate significant detailing to enhance the appearance of the breast cup. Furthermore since the breast cup is of a moulded construction it can be difficult to add any enhancements to the breast cup construction after it has been formed. Furthermore, prior to forming, the pre form sheet materials do not conveniently lend themselves to the addition of enhancements which can, along with the pre form, be conveniently moulded to define a suitable breast cup shape.

The traditional form of sewn panel breast cup constructions have incorporated panels of contrasting appearance. In particular such traditional breast cups have included a panel or panels of lace material incorporated with a silk or other general coverage material defining the breast cup construction.

Accordingly it is an object of the present invention to provide a method of producing a breast cup assembly and in particular although not solely to a method of producing a breast cup assembly which can conveniently incorporate a panel of contrasting appearance to thereby

enhance the outward appearance of the breast cup assembly or which will at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

5 In a first aspect the present invention consist in a method of making a breast cup for a garment of clothing comprising:-

 a) taking a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

10 b) engaging a flexible panel (herein after “covering panel”) of an at least part breast cup form corresponding to at least part of said structure defining component, to the structure defining component to locate said covering panel on the convex side of the breast cup form of said structure defining component in at least a partial overlapping condition, to thereby define a panel assembly which includes said structure defining component and said covering panel

15 c) affixing to the convex side of said panel assembly, a panel of flexible material (herein after “decorative panel”) of a contrasting appearance to the convex side of said covering panel in an overlying condition to part of said panel assembly and in a position to locate said decorative panel inwardly of the perimeter of said panel assembly,

20 d) removing a region of the panel assembly covered by and within the perimeter of said decorative panel to thereby expose the decorative panel to the concave side of said panel assembly.

 Preferably said affixing defined in step (c) is by affixing said decorative panel at its perimeter to said panel assembly at and about the perimeter of said decorative panel wherein said removing defined in step (d) is of a region of said panel assembly encompassed by the perimeter fixing of said decorative panel.

25 Preferably said affixing defined in step (c) is by stitching said decorative panel at its perimeter to said panel assembly at and about the perimeter of said decorative panel wherein said removing defined in step (d) is of a region encompassed by the perimeter stitching of said decorative panel.

30 Preferably said structure defining component includes a means defining a visible reference point within the perimeter of said breast cup form wherein subsequent to step (b) and prior to step (c), said reference point is relied upon to generate a visible reference point

of corresponding position visible from the convex side of said panel assembly for the purposes of reliance in step (c) to establish the appropriate said position of said decorative panel with respect to said panel assembly.

5 Preferably said visible reference point on said convex side of said panel assembly is generated by penetrating said panel assembly from said concave side to said convex side with a means visible.

 Preferably said penetrating is by stitching a line of thread through said panel assembly.

 Preferably said means defining a visible reference point is a line of reference, said stitching being along at least part of such said line.

10 Preferably said means defining a visible reference point is an endless line of reference provided about a region of said panel assembly said stitching being along said endless line, said region being of a perimeter shape commensurate with the perimeter shape of said decorative panel to thereby allow said decorative panel to be aligned with said stitching for the subsequent affixing defined in step (c).

15 Preferably means defining a visible reference point is generated during the forming of said structure defining component prior to step (a).

 Preferably said means defining a visible reference point is generated during the forming of said structure defining component prior to step (a) by embossing the visible reference point into the convex side surface of said structure defining component.

20 Preferably said structure defining component includes a sheet of foam material and said embossing is achieved by the enhanced compression of said sheet of foam material at where said visible reference point is defined during the forming of said structure defining component.

25 Preferably said structure defining component includes a sheet of foam material with which there is adhered from at least one major surface thereof a sheet of fabric material, said engaging of said structure defining component with said covering panel being to position said covering panel on the side of said structure defining component opposite to said at least one sheet of fabric material.

30 Preferably subsequent to step (d) embroidery stitching is applied at or proximate and inward of the perimeter of said decorative panel to capture within the enclosure of said embroidery stitching the edges of said panel assembly exposed by the removing of said region defined as step (d).

 Preferably said embroidery stitching also captures within the enclosure of said embroidery stitching the perimeter edge of said decorative panel.

Preferably said engaging defined in step (b) is by affixing by sewing of the covering panel to said structure defining component at the perimeter of said covering panel.

Preferably where said covering panel is of coextensive perimeter shape to the structure defining component, said engaging defined in step (b) is by affixing by sewing of the covering panel to structure defining component at the perimeter of said structure defining component.

In a further aspect the present invention consist in a method of making a breast cup for a garment of clothing comprising:-

a) taking a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

b) engaging a flexible panel (herein after "covering panel") of an at least part breast cup form corresponding to at least part of said structure defining component, to the structure defining component to locate said covering panel on the convex side of the breast cup form of said structure defining component in at least a partial overlapping condition, to define a panel assembly which includes said structure defining component and said covering panel

c) affixing to the concave side of said panel assembly, a panel of flexible material (herein after "decorative panel") of a contrasting appearance to the convex side of said covering panel in an overlying condition to part of said panel assembly and in a position to locate said decorative panel inwardly of the perimeter of said panel assembly,

d) removing a region of the panel assembly covered by and within the perimeter of said decorative panel to thereby expose the decorative panel to the convex side of said panel assembly.

In a further aspect the present invention consist in a breast cup assembly for incorporation into a garment of clothing and made in accordance to any on of the methods as herein described

In a further aspect the present invention consist in a breast cup assembly comprising

a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

a flexible panel (herein after "covering panel") affixed to said structure defining component and of an at least part breast cup form corresponding to at least part of said structure defining component, said covering panel located adjacent the structure

defining component on the convex side of said structure defining component and in an at least a partial overlapping condition with said structure defining component, to define a panel assembly which includes said structure defining component and said covering panel

5 a panel of flexible material (herein after “decorative panel”) of a contrasting appearance to the convex side of said panel assembly and affixed with, at either one side selected from said convex side and concave side, said panel assembly in an overlying condition and located in a position inwardly of the perimeter of said panel assembly,

10 wherein an opening is provided through said structure defining component at a region of the structure defining component encompassed by the perimeter of said decorative panel to there through expose the decorative panel to the opposite of said one of said convex side and concave side of said structure defining component.

15 Preferably said structure defining component includes a moulded sheet of foam material.

 Preferably said structure defining component includes a moulded sheet of foam material with which there is affixed to each opposed major surface, a panel of fabric.

20 Preferably said decorative panel is affixed to the convex side of said panel assembly by stitching extending through said decorative panel and said panel assembly and provided at or immediately inwardly of the perimeter of said decorative panel and wherein the said or a stitching at the perimeter of said decorative panel is of an embroidery kind and captures within such stitching the perimeter edge of said decorative panel.

 Preferably said structure defining component and said covering panel are coextensive.

 Preferably said covering panel is a flexible fabric material.

25 Preferably said decorative panel is a lace material.

 Preferably said structure defining component and said covering panel are coextensive and are stitched to each other at the perimeter of said cup and at where said perimeter of said decorative panel is affixed to said panel assembly.

30 In a further aspect the present invention consist in a method of making a breast cup for a garment of clothing comprising:-

 a) taking a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

b) affixing at a convex side region and in an overlying condition to said structure defining component, a panel of flexible material (herein after “decorative panel”) of a contrasting appearance to the convex side of said structure defining component, said affixing being of a position to locate said decorative panel inwardly of the perimeter of said structure defining component,

c) removing a region of said structure defining component to create an opening through said structure defining component, said opening of a region corresponding to and inwardly of the perimeter of said decorative panel to thereby expose the affixed decorative panel to the concave side of said structure defining component.

Preferably said affixing defined in step (b) is or includes affixing of at least part of the perimeter of said decorative panel with said structure defining component, said removing to create said opening being by cutting said structure defining component at a region inwardly of the perimeter of said decorative panel.

Preferably said removing to create said opening in said region of said structure defining component is such that once said region is removed, said opening remains covered by said decorative panel

Preferably prior the affixing as described in step (b), a flexible covering panel of an at least part breast cup form corresponding to at least part of said structure defining component, is engaged to said structure defining component to locate said flexible covering panel on the convex side of the breast cup form of said structure defining component in at least a partial overlapping condition with the convex side surface of said structure defining component, said flexible covering thereby forming part of the structure defining component.

In a further aspect the present invention consist in a method of making a breast cup for a garment of clothing comprising:-

a) taking a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

b) affixing at a concave side region and in an overlying condition to said structure defining component, a panel of flexible material (herein after “decorative panel”) of a contrasting appearance to the convex side of said structure defining component, said affixing being of a position to locate said decorative panel inwardly of the perimeter of said structure defining component,

c) removing a region of said structure defining component to create an opening through said structure defining component, said opening being inwardly of the perimeter of said decorative panel to thereby expose the affixed decorative panel to the convex side of said panel assembly.

5 Preferably said affixing described in step (b) is or includes affixing of at least part of the perimeter of said decorative panel with said structure defining component, said removing to create said opening being by cutting said structure defining component at a region corresponding to and being inwardly of the perimeter of said decorative panel.

10 Preferably said removing to create said opening in a region of said structure defining component is such that once said region is removed, said opening remains covered by said decorative panel

15 Preferably a flexible covering panel of an at least part breast cup form corresponding to at least part of said structure defining component, is engaged to said structure defining component to locate said flexible covering panel on the convex side of the breast cup form of said structure defining component in at least a partial overlapping condition with the convex side surface of said structure defining component, said flexible covering thereby forming part of the structure defining component.

 Preferably said flexible covering panel is affixing prior to the step described as step (b).

 In a further aspect the present invention consist in a breast cup assembly comprising

20 a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

25 a panel of flexible material (herein after “decorative panel”) of a contrasting appearance to the convex side of said structure defining component affixed with, at either one side selected from said convex side and concave side, said structure defining component in an overlying condition and located in a position inwardly of the perimeter of said structure defining component,

30 wherein an opening is provided through said structure defining component at a region of the structure defining component encompassed by the perimeter of said decorative panel to there through expose the decorative panel to the opposite of said one of said convex side and concave side of said structure defining component.

Preferably said structure defining component includes a flexible covering ply of material disposed to the convex side of said structure defining component and against which said decorative panel is engaged.

5 In a further aspect the present invention consist in method of making a breast cup for a garment of clothing comprising:-

a) taking a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

10 b) engaging a flexible panel (herein after "covering panel") of an at least part breast cup form corresponding to at least part of said structure defining component, to the structure defining component to locate said covering panel on the convex side of the breast cup form of said structure defining component in at least a partial overlapping condition, to thereby define a panel assembly which includes said structure defining component and said covering panel, said covering panel including on the convex side of said covering panel, a panel of flexible material (herein after "decorative panel") of a contrasting appearance to the convex side of said
15 covering panel, positioned in an overlying condition to said covering panel and in a position to locate said decorative panel inwardly of the perimeter of said covering panel,

d) removing a region of the panel assembly within a corresponding region of said panel assembly encompassed by the perimeter of said decorative panel to thereby expose the decorative panel to the concave side of said panel assembly.

20 In a further aspect the present invention consist in a method of making a breast cup for a garment of clothing comprising:-

a) taking a structure defining component of a breast cup form and created from a flexible sheet of mouldable material,

25 b) engaging a flexible panel (herein after "covering panel") of an at least part breast cup form corresponding to at least part of said structure defining component, to the structure defining component to locate said covering panel on the concave side of the breast cup form of said structure defining component in at least a partial overlapping condition, to thereby define a panel assembly which includes said structure defining component and said covering panel, said covering panel including on the concave of said covering panel, a panel of flexible material
30 (herein after "decorative panel") of a contrasting appearance to the convex side of said

structure defining component, positioned in an overlying condition to said covering panel and in a position to locate said decorative panel inwardly of the perimeter of said covering panel,

5 d) removing a region of the panel assembly within a corresponding region of said panel assembly encompassed by the perimeter of said decorative panel to thereby expose the decorative panel to the concave side of said panel assembly.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if
10 individually set forth.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1 – 14 illustrate the preferred steps to the method of the invention for defining
15 the breast cup construction of Figure 15, wherein

Figure 1 is a perspective view of a sheet of material to provide the structure defining component of the breast cup construction prior to being moulded,

Figure 2 is a side sectional view of a moulding device to mould two cup forms in the sheet of Figure 1,

20 **Figure 3** is a plan view of part of the sheet of Figure 1 after moulding in the moulding device of Figure 2,

Figure 4 is a detailed side sectional view of the upper mould portion of the mould of Figure 2,

25 **Figure 5** is a perspective view of a cover sheet to be incorporated with the structure defining breast cup portions,

Figure 6 is a side view of a moulding device for moulding a breast cup form in the sheet of material of Figure 5,

30 **Figure 7** is a perspective view of the sheet of Figure 5 engaged with a framing device which may be utilised for supporting the sheet of Figure 5 during the moulding phase provided by the moulding device of Figure 6,

Figure 8 is a plan view of the moulded form of Figure 1 wherein the moulded cup forms are to be cut from the remaining portions of the sheet,

Figure 9 is a sectional view through a breast cup construction assembly comprising of the structure defining breast cup component and the breast cup component defined from the sheet of Figure 5 engaged together,

Figure 10 illustrates a sewing of the structure defining breast cup component and the breast cup defined from Figure 5 together to define an outline by stitching on the convex side of the breast cup assembly,

Figure 11 illustrates the sewing of a panel of contrasting appearance on to the convex side of the breast cup assembly,

Figure 12 is a front view of the breast cup assembly defined by the step of Figure 11,

Figure 13 illustrates the removal of a region of the breast cup assembly to thereby expose the panel of contrasting appearance on the concave side,

Figure 14 illustrates an embroidery step for enhancing the appearance of the breast cup assembly, but which may have alternatively been previously defined with reference to the step of Figure 11,

Figure 15 is a front view of a breast cup construction of the present invention,

Figure 15A which is a brassiere which incorporates breast cup constructions as defined with reference to Figure 15,

Figure 16 is a sectional view of the structure defining component of the breast cup assembly engaged with the covering sheet prior to being manipulated to define the preferred relationship between the structure defining component and the covering sheet,

Figure 17 is a sectional view wherein the cover sheet and the structure defining component of Figure 16 have been manipulated to define the preferred form of their relationship which will lead to the constructional relationship as shown in Figure 9, and

Figure 18 is an alternative to the breast cup assembly of Figure 15.

DETAILED DESCRIPTION OF THE INVENTION

With reference to Figure 15, the present invention includes a method to define a breast cup assembly similar to the kind as shown in Figure 15. The breast cup assembly 1 is substantially of a breast cup shape and made substantially from mouldable materials.

The breast cup assembly includes a three dimensional body form bounded by a neckline perimeter region 2, a base perimeter region 3 and an underarm perimeter region 4. At or proximate to the junction between the neckline perimeter region 2 and underarm perimeter region 4 at point 5, will be where the breast cup assembly 1 will be incorporated with the strap of the bra as for example shown in Figure 15A. However, it is envisaged by the inventor that

the methods and breast cup assembly 1 defined by the methods of the present invention may be incorporated in a strapless bra and certainly the configuration of the perimeter of the breast cup assembly is not to be considered limited to those shown in the accompanying drawings. It is also envisaged that the breast cup assembly may be incorporated as part of a different kind of garment of clothing such as for example, lingerie, swimwear or a female dress in general. Accordingly whilst in the most preferred form reference will herein be made to a breast cup assembly particularly for its application as part of a bra, it is to be appreciated that the breast cup assembly need not necessarily be provided for the purposes of defining a component in underwear. The breast cup assembly may indeed be incorporated into a garment which is outerwear.

The breast cup assembly 1 as shown in Figure 15 includes a panel 6 of contrasting appearance to the general cup defining panel assembly 7 of the breast cup assembly 1. The panel of contrasting appearance 6 may be a panel of different material and may be of a single ply or of a multi-ply. With reference to Figure 14 which is a sectional view through part of the breast cup assembly of Figure 15, it can be seen that the panel of contrasting appearance 6 is exposed on the convex side 15 and the concave side 16 of the breast cup assembly. A panel 6 which is made of a multi-ply construction may expose to the convex side a material of one colour or texture and to the concave side a material of another colour or texture. However, in the most preferred form the panel 6 is a panel of lace material. The lace material will have a partially see through effect and provides a decorative effect to the convex side 15 of the breast cup assembly. The configuration as shown in Figure 14 where part of the generally cup defining panel assembly 7 is removed, the see through effect of the lace material can be enhanced particularly when a bra incorporating the breast cup assembly of the present invention is being worn, when the colour of the skin will be exposed in regions through the lace material.

The preferred form of constructing the breast cup of Figure 15 will now be described with reference to the drawings.

Figure 1 illustrates a sheet 10 of flexible and mouldable material which is used to define the structure defining component 31 to the breast cup assembly 1. A sheet 10 is of a perimeter size sufficient for at least one cup form to be moulded therein. In the most preferred form the sheet is of a perimeter sufficient to allow for two matching cup forms (left and right side) to be formed in the sheet simultaneously by a two cup moulding machine, as for example shown in part in Figure 2. The sheet 10 preferably consists of three layers of material. The first layer 11 is a sheet layer of foam 11 such as, for example polyurethane. In its pre-moulded form, the sheet of foam 11 is for example of a thickness of 5mm. The sheet of foam 11 has engaged to

each of its opposed major surfaces, layers of thin flexible sheet such as a fabric material 12, 13. The layers of fabric material 12, 13 are adhered preferably directly to the opposing major surfaces of the sheet of foam 11. Such adhesion may be by heat welding and/or adhesive affixing. The sheet 10 is preferably cut from a bulk supply of material to define the sheet and accordingly the fabric layers 12, 13 are substantially co-extensive with the sheet of foam 11. The layers of fabric 12, 13 are preferably of a woven fabric, however alternatively the layers 12, 13 are of a non-woven kind. All plies of the sheet 10 are of a synthetic and mouldable material.

In an alternative form of the sheet 10 of Figure 1, a fabric layer may be applied only to one major surface of the sheet of foam 11. Whilst such a form is less desirable it is envisaged that the breast cup assembly 1 and the methods of forming the breast cup assembly 1 may utilise such a single side fabric covered sheet of foam assembly. Reference will briefly be made to such an alternative form hereinafter as the methods of construction of the present invention are described.

The sheet 10 has a moulded cup form or forms introduced therein by a moulding device as, for example, in part shown in Figure 2. The moulding device includes an upper mould portion 17 and a lower mould portion 18. It can be seen in the arrangement of Figure 2 that the upper mould portion includes convex moulding surfaces and the lower mould portion includes substantially complimentary shaped concave moulding surfaces to introduce two, three dimensional cup forms into the sheet 10 of the Figure 1.

Preferably although not essentially, the moulding step to define the moulded cup form(s) in the sheet 10 of Figure 1 also includes the provision of an embossed or depressed relief to the concave side of the moulded cup form(s). Such embossing is preferably provided by an upstanding region 19 of at least one of the convex cup moulding surfaces of the upper mould 17.

Preferably where both cups to be incorporated into the bra are to include the panel 6 as shown in Figure 15 then both convex up stands of the upper mould portion should include the upstanding surface 19. Since the panel 6 is to be incorporated into the cup form within the boundaries 2, 3, 4 of the perimeter of the cup, the embossing defining upstanding portion 19 provide an embossed region which preferably defines an enclosed region to the concave side of the cup shapes formed in the sheet 10.

With reference to Figure 3, the embossed region 20 is defined by the moulding device within the perimeter defined by edges 2, 3 and 4 of the cup forms of the sheet 10. In the examples shown in Figure 3, the embossing is of a track like form which defines the perimeter

to the region 22 bounded by the embossing. Such a track form is for example, able to be defined by an upstanding track like region 19 of the upper mould 17 as shown in Figure 4.

In an alternative form the entire region 22 is embossed or depressed and such may be provided by an upstanding region which is entirely upstanding from the cup defining surface 25 of the upper mould portion 17. In effect the embossing step reduces the thickness of the panel 10 by compressing the sheet 10 and in particular the foam 11 of the sheet at regions of embossing to an extent greater than the remaining regions of the sheet 10 within the moulded breast cup form. The embossed relief is for example shown in Figure 9. The provision of the embossed relief to the concave side of the breast cup form of the sheet 10 is not essential but is preferred for the purposes of allowing for duplicated and repeatable placement of the panel 6 with the convex side of the cup form. The purposes of the embossing to allow for such consistent placement will become apparent as the steps to the method are further explained.

Once the cup form(s) are moulded in the sheet 10 the cup form(s) may be cut from the remainder of the sheet 10 as for example shown in Figure 8.

In the most preferred form the cup forms are cut from the remainder of the sheet 10 prior to the engagement of a covering panel 30 to the structure defining component 31 of the cup forms defined from the then moulded sheet 10. However it may be possible to engage the covering panel 30 to the structure defining component 31 whilst still engaged to the remainder of the foam sheet 10. However, preferably the covering panel 30 is engaged to the structure defining component 31 once the structure defining components are removed from the remainder of the sheet 10.

The covering panel 30 is preferably disposed from the convex side of the structure defining component 31. The cover panel 30 is preferably defined from a sheet of mouldable flexible material as for example shown in Figure 5. The flexible sheet 30 is preferably of a single ply material such as a fabric material. It is preferably made from a synthetic material such as a nylon/lycra blend of 86% nylon and 14% lycra.

In order to ensure that the covering panel (covering fabric) 30 can conveniently conform to the three dimensional cup shape of the structure defining component 31, the covering fabric 35 is preferably moulded to a three dimensional cup form substantially commensurate with the three dimensional cup form of the structure defining component 31 to which it is to be engaged. The covering fabric may for example be moulded in a moulding device as for example in part shown in Figure 6, the device providing two moulded cup forms into a single sheet of covering fabric 35. For the purposes of such moulding step the fabric sheet 35 may need to be engaged

with a frame 36 which will hold the perimeter of the fabric sheet 35 in position during the moulding process to prevent the fabric sheet 35 from wrinkling during the moulding step.

5 The cup forms defined in the fabric sheet 35 may then be applied to the convex side of the structure defining component 31 and affixed thereto. It may cover the entire convex side or part of the convex side (see Figure 18). Such a fixing may be achieved in one of several manners the details of which will be hereinafter described.

The cup forms formed in the fabric sheet 35 may be cut prior to being affixed to the structure defining component 31 or after.

10 The purpose of affixing the covering fabric 30 to the structure defining component 31 is to ensure that they remain in register together.

In the version of the method of the present invention where the embossing step is provided, the embossing is effectively provided for the purposes of aiding the positioning of the panel 6 in a repeatable manner with the structure defining component and cover fabric assembly (hereinafter the "panel assembly 90").

15 The purpose of providing the embossed region on the concave side of the structure defining component 31 is to allow for a means of reference to be generated on the convex side of the panel assembly which will allow for the placement of the panel 6 to be positioned in the desired position. The way in which the reference is provided to the convex side is preferably by stitching panel 6 to the panel assembly 90 as shown in Figure 10 together along the perimeter to the bounded area 22, bounded by the embossed region 20. Such stitching 49 is preferably applied by the use of a sewing machine which can apply a straight line stitching following the outer perimeter of the embossed relief, in the concave side of the panel assembly.

20 A sewing machine operator can manipulate the assembly of panels to position this relative to the sewing machine to provide stitching through the panel assembly 90 along the perimeter of the embossed region 20. Such stitching will penetrate through all of the panels and will present a line of stitching 49 exposed to the convex side of the panel assembly 90. A panel 6 is preferably cut to a shape matching the shape of the line of stitching can then be positioned against the convex side of the assembly, its position gaining reference from the line of stitching visible 49 to the convex side of the panel assembly 90 to thereby accurately position the panel 6 in the desired location.

25 Whilst in the preferred form such stitching 49 is provided through the layers of the panel assembly 90 to define an enclosed region which proximately corresponds to the enclosed region 22 defined by the embossing on the concave side, it will be appreciated that since the primary purpose of providing the stitching is to provide reference points to the convex side such

stitching need not be continuous. Indeed it is envisaged by the inventor that the stitching may provide two reference points visible from the convex side. Such two reference points can be sufficient to allow for the correct positioning of the panel 6 in the desired location against the convex side of the panel assembly 90.

5 In an alternative form of the present invention however the embossing may not be provided for the purposes of generating the cup assembly 1 of Figure 15. It may be that approximate positioning by line of sight by the operator of a sewing machine may be sufficient to generate a desired result. However for mass production the repeatability of positioning is preferred and accordingly the embossing and stitch through steps to define the reference stitching 49 is preferred. It is however anticipated by the inventor that alternative forms of defining a reference point on the convex side of the panel assembly is achievable. However, it is most preferred that any means for defining the reference points are introduced at the moulding steps and not on the perform sheet 10. This is because during the moulding step movement of the material as a result of the moulding may not be predictable. Accordingly any screen printing or other marking provided on a surface of the sheet 10 may not end in a repeatable position on the cup form once the sheet has been rolled. Accordingly it is believed by the inventor to be most reliable to introduce a means for defining the reference (i.e.; the embossing) during the moulding phase.

20 The affixing of the panel 6 to the convex side 15 of the assembly is preferably also achieved by stitching. Such stitching 50 is preferably at and about the entire perimeter of the panel 6 as, for example, shown in Figure 11. Since this stitching 50 is going to be a visible part of the final construction of the breast cup assembly and the brassiere incorporating such, the stitching 50 is preferably of an aesthetic kind such as, for example, of an embroidered or overlocking kind. The embroidered type of stitching that is preferably utilised for the stitching 50 is of a kind which defines a beaded like line of stitching. Such stitching will extend to the perimeter of the panel 6 and cover the perimeter of the panel 6 so that the perimeter of the panel 6 will be captured within the embroidered like stitching and not be visible. Such is for example, shown in Figure 14. The stitching 50 may however be of a different kind or may not be of a final finishing kind and reference to the stitching 50 will hereinafter be again referred to once some further aspects of the invention have been described.

30 In the most preferred form and as has so far been described, the panel 6 is preferably affixed to the convex side of the panel assembly 90. Such is desirable as, once incorporated, the panel 6 will have the appearance of being substantially at the convex surface of the cup assembly. However in an alternative form the panel 6 may be affixed to the concave side of the

assembly. In such an example the panel 6 is provided to the concave side. If reference points for the positioning of such panel are to be provided, the steps of embossing may need to be provided to the convex side.

5 With reference to Figure 11, it can be seen that the structure defining component 31 defined from the panel 10 is of an alternative kind wherein only a single layer of fabric material 12 is provided to the foam panel 11. Whilst it is envisaged that this is one form of construction of the assembly of the present invention it is less desirable since the foam may be subjected to weathering wherein its colour may vary from the colour at manufacture. In particular foam has a tendency to "yellow" and should the covering fabric 30 not be of a construction which may prevent such yellowing and prevent such yellowing from being visible from the convex side of the cup construction, the discolouring of the foam will be an undesirable effect to the appearance of the final breast cup assembly.

10 Accordingly the most preferred form is where the foam has a fabric panel on both sides and in particular so as to provide a two layer panel assembly to the convex side of the cup construction.

15 As an alternative the covering fabric may be absent from the panel assembly and the breast cup assembly may only include the structure defining component formed from the sheet 10 without another layer provided external thereof. The panel 6 may then be affixed direct to the layer 13 of the structure defining component. A variation to this is where the panel is affixed to the fabric panel 12 on the concave side. The structure defining component is then cut to create the opening to expose the panel 6 to the other side.

20 Once the assembly as for example shown in Figure 11 has been defined, material to the concave side of the panel 6 may be removed so as to provide a single panel thickness through this area. The fabric layer 12, the foam layer 11, the optional fabric layer 13 and the covering fabric 30 are removed within the region bounded by the perimeter of the panel 6 and intermediate of the stitching 50 about the panel 6. In the example and in the preferred form where the panel 6 is of a lace material such removal of the layers will expose the lace to the concave side of the construction which will have an enhanced and more desirable visual effect. Such an effect will be provided by a partial see through from the convex side to the concave side and when the breast cup assembly 1 incorporated with a brassiere is worn against the skin of a person, the skin of the person will be visible in part through the panel 6. Where the panel 6 is affixed to the concave side of the assembly the same material removed for the preferred configuration of Figure 11 may occur, however such removal is achieved from the convex side.

In the configuration of Figure 11 the material is removed by cutting the material away from the concave side of the panel assembly 90.

As can be seen with reference to Figure 15 the panel 6 is provided within the bounds of the cup construction (boundaries 2, 3 and 4). The panel is bounded by stitching 50 which
5 retains the panel 6 to the main body 7 of the cup construction. The cutting away of the material may be achieved by the use of scissors. Such cutting may be along the regions of the assembly within the bounds of the stitching 50 and such cutting may be assisted by it being along part of the embossed region 20.

Once the material has been removed, edges of the material will be exposed and such is
10 visually appealing. Accordingly a second line of stitching is introduced to capture within the bounds of the stitching, the edges of the exposed plies of material resulting from the cutting away of the section as described above. The stitching is preferably along the line of stitching 50 and is preferably of an embossed kind so that it will capture within its bounds, the edges of the cut away fabric. Accordingly two sets of stitching may be provided along the line of stitching
15 50 shown in the drawings. The first line of stitching being to attach the panel 6 to the panel assembly 90 and the second provided for the purposes of capturing the edges exposed by the cutaway sections.

The assembly in the condition as for example shown with reference to Figure 13 and 15, can then be incorporated with other components to define a brassiere 60 as for example shown
20 in Figure 15A.

The covering fabric 30 is preferably engaged to the components of the sheet 10 by perimeter stitching 65. However in addition to such stitching to affix the covering fabric adhesive may be applied between the covering fabric and the structure defining component 31. Such adhesive may be applied everywhere save for the region of the assembly where the
25 material is to be cut away to expose the panel 6 to the concave side of the cup construction.

In order to create a cup assembly which is aesthetically appealing, the covering fabric 30 is engaged to the structure defining component 31 in a manner to provide blind stitching at least along the neckline perimeter 2.

With reference to Figure 16 and 17 such blind stitching may be achieved by the
30 engagement of the covering fabric 30 with the structure defining component 31 along the perimeter 2 by reversing the covering fabric 30 from the side it is affixed to of the structure defining component 31 to the convex side. A blind stitching configuration will then be provided along the perimeter 2. Since this perimeter 2 will be that part of the breast cup construction which will be a substantially free edge and may be more exposed to be seen than

the other edges e, it is desirable for such blind stitching to be provided at this edge. It may however be feasible for such blind stitching to also be provided along the perimeter edge 4.

The moulding of the sheet 10 in the moulding device of Figure 2 may for example occur where the upper mould is of approximately 101°C and the lower mould is approximately under 95°C. The moulding time for such temperatures and the preferred materials will be for a period of about 120 seconds. The moulding of the fabric panel 35 preferably occurs where the temperatures of the upper mould is approximately 208°C and the lower mould is 215°C. The moulding or dwell time is approximately 80 seconds.

An alternative to the method of constructing the cup assembly of the present invention will now be described. Such an alternative is not an alternative to all the steps but to part of the process of affixing the panel 6 with the covering fabric 30. It is anticipated that the provision of the panel 6 to the panel assembly 90 may occur at a step prior to the covering fabric 30 being engaged to the structure defining component 31. The panel 6 may be affixed to the covering fabric 30 pre or post moulding of the fabric sheet 35 to define the covering fabric 30. The panel 6 may be affixed to the fabric sheet 35 by sewing subsequent to which the assembly is placed in a moulding device to define the covering fabric with the panel engaged thereto. However such may create difficulties with respect to the position of the panel 6 and the maintaining of the structural integrity of the fabric sheet 35 to define the covering fabric 30. Since the covering fabric 30 is of a thin material the provision of the panel 6 to the covering fabric after moulding but prior to its engagement with the structured defining component may also not be sufficient to allow for convenient engagement thereto of the panel 6. However since it is anticipated that such a step in the process of the provision of the cup assembly may be achievable, the methods of the present invention includes this alternative step to the construction of the cup assembly.

The covering fabric 30 is preferably provided coextensive with the structure defining component 31. However with reference to Figure 18 it can be seen that the covering fabric 30 may not be coextensive with the structure defining component and there may be a seam of embroidered stitching 91 extending between the edge of the covering fabric 30 and the upper surface 13 of the structure defining component 31. In such a configuration, the covering fabric 30 is however provided to the structure defining component where the panel 6 is to be provided. Panel 6 will hence be captured also within the boundaries of the fabric panel 30. Whilst reference is made to the provision of a decorative panel 6 to the breast cup, it is envisaged that more than one discrete panel 6 may be provided to each cup assembly.